

Amendments to the Drawings:

The attached sheet of drawings includes amendments to **FIG. 7** and **FIG. 8**.

a. In the amendment to **FIG. 7**, the text box for **70** was expanded so the text would appear on a single line with the intention of improving text scanning to prevent characters from dropping out, giving the impression that some words are misspelled. The font size for "**FIG. 7**" was increased by one size. The text box for **84** was also expanded for the same reasons as set forth above for **70**.

b. In the amendment to **FIG. 8**, the text box for **70** was expanded so the text would appear on a single line with the intention of improving text scanning to prevent characters from dropping out, giving the impression that some words are misspelled. The font size for "**FIG. 8**" was increased by one size. The text box for **94** was also expanded for the same reasons as set forth above for **70**. The text box for **92** was expanded so that the drawing would fit within the margins pursuant to **37 C.F.R. §1.84(g)**.

Attachments:

2 Replacement Sheets

2 Annotated Sheets Showing Changes

REMARKS

Applicant thanks the Examiner for his thoughtful review of the present application. The amendments to the claims are described below in the **PRESENT AMENDMENT**. The status of the claims is as follows:

- a. Method Claims 1 – 18 are Pending in the present application.
- b. Independent Claims 1 and 10 have been Amended herein.

i. **PRESENT AMENDMENT**

Independent Claims 1 and 10 were amended to distinctly point out and particularly claim the subject matter the Applicant regards as his invention. Specifically, those claims now recite that the patterning of the mold layer consists of a single masking step and the etching of the mold layer consists of a single etch step. Support for the amendments to Claims 1 and 10 can at least be found in FIGS. 7, 8, 9A, and 9B of the Drawings and on Pages 10 and 11 of the Detailed Description.

FIG. 7 and FIG. 8 of the Drawings were amended to expand text boxes in the flow charts to allow for easier scanning of text without characters dropping out.

No new matter was introduced by amending the application.

ii. **ARGUMENT**

a. **Objections to FIG. 7 and FIG. 8 in the Drawings**

In the Office Action, the Examiner objected to misspelled words in text boxes 70 and 84 in FIG. 7 and text box 94 in FIG. 8. Upon closer examination it was found that the words were not misspelled, but rather problems in scanning the drawings may have resulted in characters in some of the word dropping out, thereby giving the impression that those words were misspelled.

As amended herein, the text in FIGS. 7 and 8 contain no misspelled words and are no longer objectionable. Therefore, the objections to FIG. 7 and FIG. 8 ought to now be withdrawn.

b. **Rejections of Claims 1 – 2, 4 – 5, 10 – 11, and 13 – 14 under 35 U.S.C. §103(a) (243, 580, 331 References)**

A prima facie case of obviousness under 35 U.S.C. §103(a) requires that all claim limitations be taught or suggested by the cited prior art references and there must be a teaching, a suggestion, or a motivation to combine or modify the references to arrive at the claimed invention.

The Applicant respectfully traverses the rejections because all of the method steps of independent **Claims 1 and 10** as amended herein are not taught or suggested by U.S. Patent 6,136,243 to *Mehergany*, U.S. Patent 6,309,580 to *Chou*, Published U.S. Application 2002/0137331 to *Chang*, or by the prior art disclosed in FIGS. 1A – 5B of the present application when those references are considered individually or in any combination.

First, *Mehergany* teaches away from patterning a mold layer and “*the patterning consisting of a single masking step*”. Second, *Mehergany* also teaches away from etching the mold layer to form a cavity in the mold layer and “*the etching consisting of a single etch step*”. For example, see steps (a), (b), (c), and (e) in claims 3, 5, 6, 7, and 8 in cols. 7 – 9 and claim 1 in col. 7 of *Mehergany* where: (a) is depositing and patterning of a first mask layer; (b) is depositing and patterning of a second mask layer; (c) is performing a first etch process; and (e) is performing a second etch process.

The two patterning and the two etching processes are necessary to form the shallow and deep portions of the final mold pattern in which the SiC atomizer is to be formed. See *Mehergany* figs. 1(a) – 1(f), col. 1, lines 9 – 16, and the Abstract. Not only does *Mehergany* teach away from using a single masking step and a single etch step, *Mehergany* is also silent as to dispensing with the second patterning step and the second etching step because they are necessary to form the next deepest part of the mold (see col. 4, lines 1 – 20).

Third, the high precision part formed by the casting process of *Mehergany* is non-operative for use as an imprint stamp because the part formed using the casting process disclosed by *Mehergany* is intended for use as an actual working part of an apparatus (e.g. a fuel atomizer for turbine engines). For example, the finished atomizer in fig. 5 is not suitable as an imprint stamp because it will not produce a functional atomizer if used to emboss a media, such as photoresist, for example. The embossing would result in a negative of the atomizer being formed in the media such that orifice O would no longer be an orifice through which fluid can flow, but rather the orifice O would become a solid cylinder in the embossed media. Similarly, the raised islands I, the slots T, the annulus A, and the spin chamber would have inverse shapes that would defeat the function of the atomizer, thereby rendering the embossed part inoperative as an atomizer.

In that the atomizer of fig. 5 is made from SiC to take advantage of the superior material properties of SiC, such as resistance to erosive operating conditions, high-temperature stability, and wear resistance, for example, one skilled in the art would not be motivated to take a functional high precision SiC component and then imprint an

inferior material (e.g. photoresist) with the SiC component. Even if the imprinted media is later used as the mold in a subsequent process where SiC is deposited in the mold, the resulting SiC component would not be as precise as the original functional SiC component due to replication errors induced by the imprinting process and by subsequent processing steps. Consequently, all of the process steps and their limitations as now recited in independent **Claims 1 and 10** are not taught or suggested by *Mehergany*.

As for *Chang*, in Figs. 3 - 8, the cavity 150 with reduced dimensions is formed by depositing a photoresist layer 110, followed by patterning and etching to form a plug-like structure 110 that stands proud of the substrate 100 and has a dimension W2. None of those additional steps are recited in independent **Claims 1 and 10** of the present application.

Next, the plug-like structure 110 is completely covered by a first oxide layer 120, followed by etching the first oxide layer 120 down to the plug-like structure 110 thereby exposing an upper surface of the plug-like structure 110 for a subsequent etch step where the plug-like structure 110 is removed. After removing the plug-like structure 110, the first oxide layer 120 includes a cavity 115 having a dimension W2. Next, a second oxide layer 130 is conformally deposited in the cavity, followed by an anisotropic etch step to form sidewall spacers 140a and 140b in the cavity 150.

Chang, teaches away from the method of the present application because nothing in the claims at issue recite first forming a plug-like structure that serves as a platform around which a cavity is formed in an oxide that surrounds the a plug-like structure. The number of process steps required to execute the spacer formation disclosed by *Chang* exceeds the number of steps recited in **Claims 1 and 10**. The cited sections of *Chang* do not disclose that the steps for: forming the plug-like structure; depositing and etching the first oxide; and etching away of the plug-like structure, can be eliminated and that the conformal deposition of the second oxide layer 130 in the cavity can occur sans the previously mentioned steps.

Therefore, one skilled in the art upon reading *Chang* would not be motivated to forego all the process steps disclosed in *Chang* and arrive at the fewer process steps for forming the spacer layer as recited in **Claims 1 and 10** of the present application.

Chou does disclose an imprint stamp with features 16 that can be formed from SiC; however, *Chou* is silent as to how the imprint stamp is formed. Moreover, the focus of *Chou's* disclosure is in the application of a RELEASE material 17 to the features 16 that aid in preventing a film layer 20 embossed by the stamp from adhering to the features 16 after the imprint stamp is withdrawn from the film layer 20 (see the Abstract and Fig. 1a of *Chou*). Although SiC is mentioned as one of a list of suitable materials for a release surface (see col. 6, lines 56 – 67), *Chou* is silent as to how one would fabricate a SiC imprint stamp. One skilled in the art would not be motivated to combine the teachings of *Chou* with those of *Chang* or *Mehergany*. First, *Chou* teaches an already formed SiC imprint stamp with feature sizes below a lithographic limit (see Figs. 2 and 3); therefore one skilled in the art would not be motivated to include the spacer teachings in the disclosure of *Chang* with the teachings of *Chou*. Second, as argued above, the micro-casted high resolution SiC parts as disclosed by *Mehergany* are not suitable for use as imprint stamps because imprinting with the finished SiC part merely produces a negative non-operable part in the embossed media.

Finally, what the Examiner contends is admitted prior art, as disclosed in **FIGS. 1A – 5B** of the present application, does not teach or suggest the deposition and etching of a spacer layer to reduce feature sizes in the mold to a sub-lithographic feature size. Moreover, the objective of the present invention was to produce a mold in which the final feature size is below the lithographic limit of the system used to pattern the mold layer. The prior art depicted in **FIGS. 1A – 5B** does not teach or suggest how to achieve that objective.

In conclusion, all of the claim limitations as set forth in independent **Claims 1 and 10** as amended herein are not taught or suggested in the cited sections of *Chou*, *Chang* and *Mehergany* considered individually or in any combination. Consequently, **Claims 1 and 10** are non-obvious and are patentably distinct in view of *Chou*, *Chang* and

Mehergany and the rejections of **Claims 1 and 10** under 35 U.S.C. §103(a) ought to now be withdrawn.

Claims 2 – 9 and 11 – 18 depend from independent **Claims 1 and 10** respectively and inherit all of their limitations. Therefore, **Claims 2 – 9 and 11 – 18** are also non-obvious and are patentably distinct in view of *Chou, Chang* and *Mehergany*, and the rejections of **Claims 2 – 9 and 11 – 18** under 35 U.S.C. §103(a) ought to now be withdrawn.

c. Rejections of Claims 3 and 12 under 35 U.S.C. §103(a) (243, 580, 331, & Wolf Vol. 4 References)

For at least the same reasons as argued in (b.) above, the CMP disclosure of *Wolf Vol. 4* (*Wolf-4* hereinafter) in combination with *Chou, Chang* and *Mehergany* does teach or suggest all of the claim limitations of independent **Claims 1 and 10** from which **Claims 3 and 12** depend. Accordingly, dependent **Claims 3 and 12** are non-obvious and patentably distinct in view of *Chou, Chang, Mehergany*, and *Wolf-4* and the rejections of **Claims 3 and 12** under 35 U.S.C. §103(a) ought to now be withdrawn.

d. Rejections of Claims 6 - 7 and 15 - 16 under 35 U.S.C. §103(a) (243, 580, 331, & 117 References)

For at least the same reasons as argued in (b.) above, the mounting of a plurality of SiC imprint stamps to a master substrate as disclosed by U.S. Patent 6,943,117 to *Jeong* (*Jeong* hereinafter) when viewed in combination with *Chou, Chang* and *Mehergany*, does teach or suggest all of the claim limitations of independent **Claims 1 and 10** from which **Claims 6 - 7 and 15 - 16** depend. Accordingly, dependent **Claims 6 - 7 and 15 - 16** are non-obvious and patentably distinct in view of *Chou, Chang, Mehergany*, and *Jeong*, and the rejections of **Claims 6 - 7 and 15 - 16** under 35 U.S.C. §103(a) ought to now be withdrawn.

e. Rejections of Claims 8 - 9 and 17 - 18 under 35 U.S.C. §103(a) (243, 580, 331, & Rossnagel References)

For at least the same reasons as argued in (b.) above, the anisotropic RIE process disclosed in Rossnagel et al. (*Rossnagel* hereinafter), when viewed in combination with *Chou*, *Chang* and *Mehergany* does teach or suggest all of the claim limitations of independent **Claims 1** and **10** from which **Claims 8 - 9** and **17 - 18** depend. Accordingly, dependent **Claims 8 - 9** and **17 - 18** are non-obvious and patentably distinct in view of *Chou*, *Chang*, *Mehergany*, and *Rossnagel*, and the rejections of **Claims 8 - 9** and **17 - 18** under 35 U.S.C. §103(a) ought to now be withdrawn.

iii. CONCLUSION

Applicant now believes the present case to be in condition for allowance. Therefore, the Applicant respectfully requests a Notice of Allowance for this application from the Examiner.

Respectfully submitted,

Brian R. Short

Brian R. Short

Reg. No. 41,309